MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2022/2023

EEE7296 – ENERGY MONITORING AND AUDITING

(LE)

14 JULY 2023
1:00 PM – 4.00 PM
(3 Hours)

INSTRUCTIONS TO STUDENT

1. This Question Paper consists of 6 pages including the cover page with 4 Questions only.
2. Answer **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please print your answers in the Answer Booklet provided.

Question 1

c) Ahmad is conducting a preliminary energy audit for a factory. According to the factory's management, the factory operates 60 hours a week. Outside the operating hours, there is only minimal lighting. The energy use data extracted from the electric bills are given in Table Q1-1. Identify and explain a problem with the provided data.

[12 marks]

Table Q1-1

Month	Maximum Demand	30-day Energy Consumption
Jan 2021	250 kW	100 MWh
Feb 2021	250 kW	115 MWh
Mar 2021	250 kW	110 MWh

d) Ali is conducting a benchmark audit for a 3-floor serviced office building in Kuala Lumpur. The building has a basement carpark. The 3 office floors are known as GF, 1F, and 2F. They have a floor plan similar to Fig. Q1. The shaded areas are lettable areas. Other data is given in Table Q1-2.

i) Compute the building energy intensity (BEI).

[9 marks]

ii) Using a BEI of 150 as a benchmark, estimate the energy saving potential of the building.

[4 marks]

Table Q1-2

Monthly office energy consumption	150MWh
Monthly car park energy consumption	1 MWh
Average occupancy	80%
GF operating hours	7 am – 7 pm (Monday to Saturday)
1F, 2F operating hours	8 am – 6 pm (Monday to Friday)

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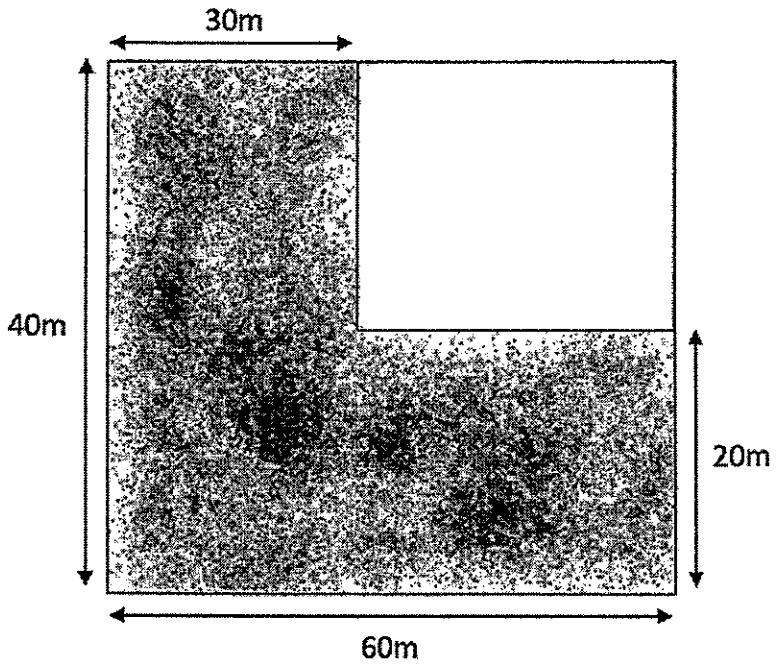

Fig. Q1

Question 2

Determine the net heat loss or gain during the adiabatic mixing of two moist air stream in a home shown in Fig. Q2 and Table Q2 using the psychrometric chart in the appendix. Also determine the ratio of the line segment between them and perform the home comfort zone analysis. The air flow data are as follows:

[25 Marks]

Table Q2

	Air flow 1	**Air flow 2**	**Air flow 3**
T_D	43.3°C	26.7°C	?
T_W	37.8°C	80%	?
V_F	112 m3/min	28 m3/min	

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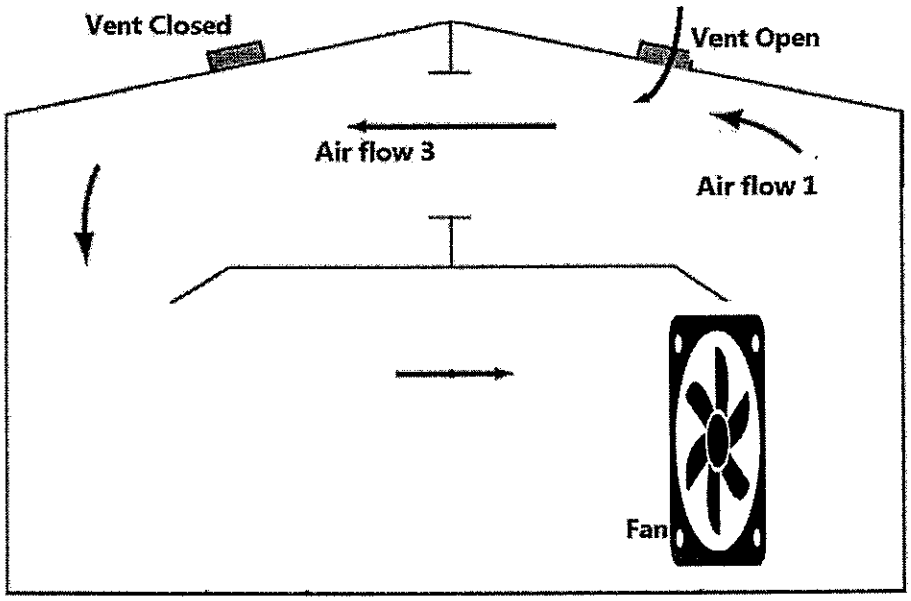

Fig. Q2

Question 3

a) Differentiate between isolated savings and integrated savings. Give ONE example of each.

[6 Marks]

b) Data center is a space dedicated to house computer systems and associated components, such as telecommunications and storage systems. Globally, it consumes a significant amount of energy and the energy demand is expected to continue its exponential growth in the coming years. You are tasked to conduct an energy audit for an existing data center.

(i) Anticipate and identify TWO primary source of energy usage.

[3 Marks]

(ii) Recommend THREE measures to reduce energy usage by each of the primary source of energy usage that you have identified in (i).

[3 Marks]

c) You are energy auditing an office building. Table Q3 shows the data of the office building's envelope and a proposed retrofit to improve the envelope insultation. Fig Q3 shows the energy end use pie chart of the building. Assume that about 50% of the cooling load is affected by insulation. Figure out the percentage of energy savings achievable by the proposed retrofit.

[13 Marks]

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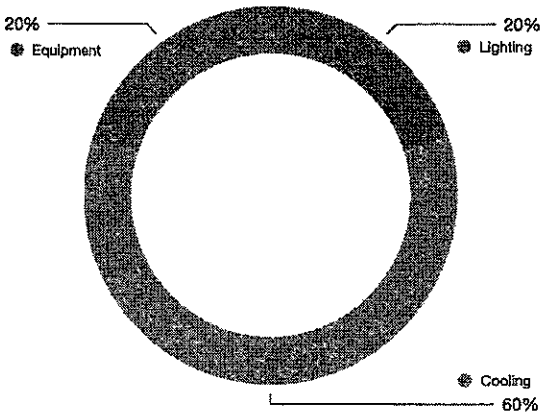

Fig. Q3

Table Q3

	Area (m^2)	U-value	
		Existing	Proposed
Roof	1600	0.2	0.2
Concrete wall	2800	0.2	0.07
Glass window	2000	1.0	0.4

Question 4

a) Explain briefly the working of the following:

i.) Dry & Wet Bulb Temperature Meter [5 Marks]

ii.) RTD&Thermocouple [5Marks]

iii.) Hygrometer Meter [5 Marks]

iv.) Whirling Hygrometer [5 Marks]

b) The building envelope of a building consists of elements which encloses conditioned spaces through which thermal energy may be transferred. List FIVE data which are required for a building envelope audit.

[5 Marks]

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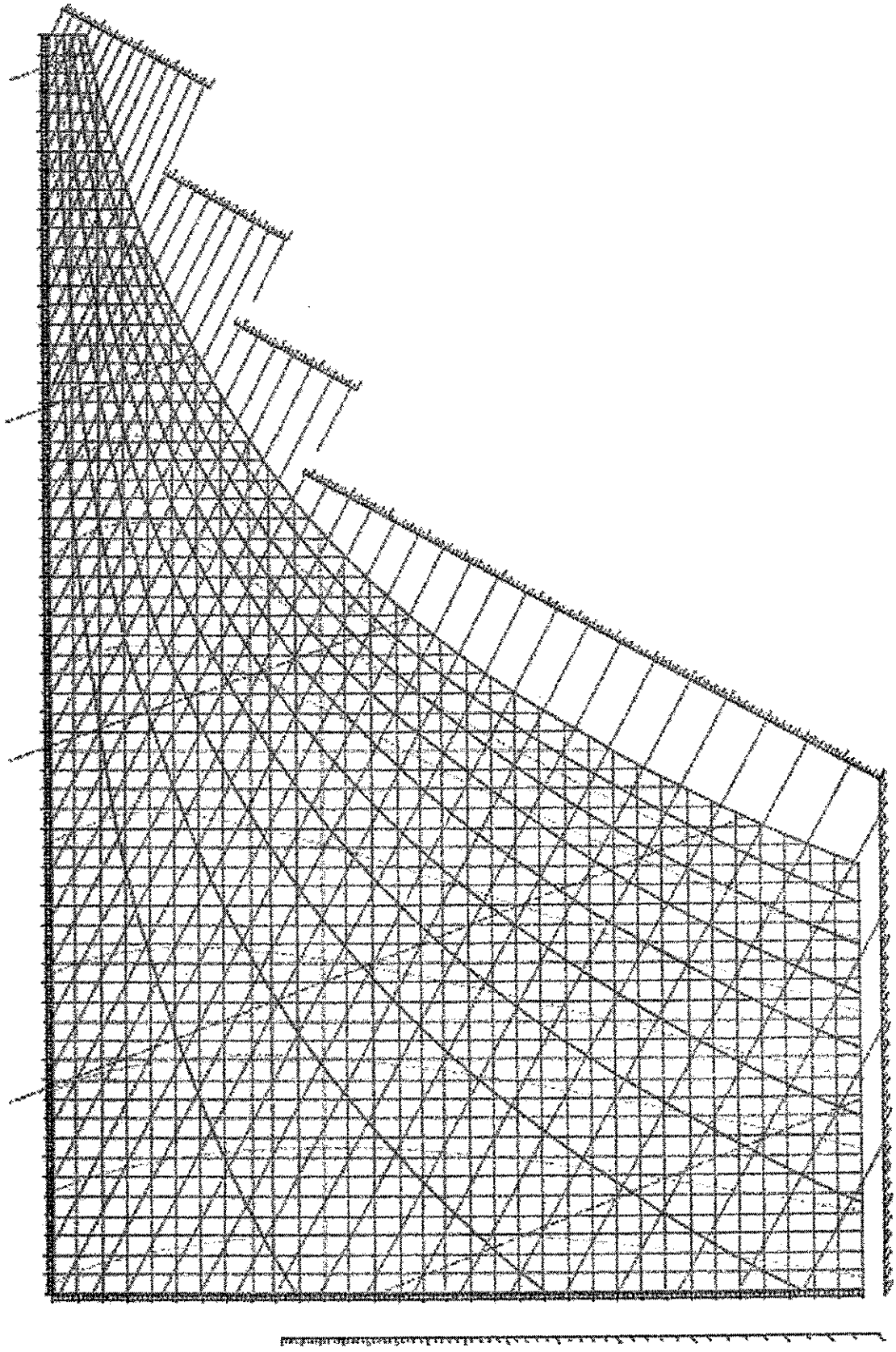
Appendix



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